SYSTEM AND METHOD FOR PROVIDING DYMANIC SELECTION OF COMMUNICATION ACTIONS USING STORED RULE SET

5 ## FIELD OF THE INVENTION

The present invention relates generally to communication systems. In particular, the present invention provides a method and system for dynamically selecting actions and dynamically routing communications to the most appropriate communication device of a user.

10 ## BACKGROUND OF THE INVENTION

Customer services, such as voice mail service is well known in standard and cellular telephone systems. With voice mail services, one user can leave an audio message for another user when the other user is not available for some reason (e.g., is currently talking on the telephone or is physically not present to answer the telephone). In one typical scenario, a cellular telephone user makes a cellular telephone call to a telephone subscriber of the public switched telephone network (PSTN). When the PSTN subscriber is currently on the telephone and has purchased the voice mail service option from the local telephone service company, the call is transferred to a voice mail system together with a voice mailbox identification of the PSTN subscriber (typically the PSTN subscriber's telephone number). Upon receiving the call, the voice mail system retrieves the PSTN subscriber's audio prompt message from memory and conveys the prompt message to the caller. In response to the prompt message, the caller transmits an audio message that is stored by the voice mail system in a memory location associated with the PSTN subscriber. When the PSTN subscriber is alerted or eventually decides to check his or her voice messages, the PSTN subscriber simply calls the voice mail system and instructs the voice mail system (usually via telephone keypad entries, but alternately using voice commands) to retrieve and play the stored message.

30 In another typical scenario, a PSTN subscriber makes a telephone call to a cellular telephone user. When the cellular telephone user is currently unable to

answer the call and has purchased the voice mail service option from the cellular telephone service provider, the call and a voice mailbox identification of the cellular subscriber (typically the cellular subscriber's telephone number) are transferred within the cellular system infrastructure to a voice mail system coupled

5   to the cellular system infrastructure. Upon receiving the call, the voice mail system retrieves the cellular subscriber's audio prompt message from memory and conveys the prompt message to the caller via the cellular infrastructure. In response to the prompt message, the caller transmits an audio message that is stored by the voice mail system in a memory location associated with the cellular

10   subscriber. To check his or her voice mail messages, the cellular subscriber simply calls the voice mail system and instructs the voice mail system to retrieve and play the stored message. In the above-described ways, voice mail allows cellular and PSTN users to receive messages that they would otherwise not be able to receive. Thus, voice mail is a very powerful communication feature in

15   today's fast-paced world.

Current voice mail (VM) systems allow limited customization of voice mail messages. For example, some current voice mail systems have the capability to play one message during office hours and a different message after office hours. This illustrates a basic time-based method to determine which of two messages to

20   present to callers.

It would be advantageous to provide an improved system and method by which a caller may find and contact a subscriber and/or relevant communication device to provide improved services.

BRIEF DESCRIPTION OF THE DRAWINGS

25   FIG. 1 is a block diagram illustrating of a communication system;

FIG. 2 is a diagram illustrating an initial routine for populating a database in the communication system;

FIG. 3 is a flow chart illustrating a method providing a call action;

FIG. 4 is a flow chart continued from FIG. 3; and

30   FIG. 5 is a block diagram of another communication system.

DETAILED DESCRIPTION OF THE
PRESENTLY PREFERRED EMBODIMENTS

A method and system selects and executes an action in a communication node. The communication node is advantageously in communication with at least a schedule database and a rules database. When an incoming communication directed to a subscriber is received, a communication priority is determined. The status of the subscriber is determined by accessing the rules database, the rules database having a rule set for the subscriber. An action is selected based on the rule set for the subscriber using the communication priority and the subscriber status.

The system can include a communication device determining server, element or function that includes the capability to determine which communication device would be most appropriate in regards to contacting the subscriber and may be adapted to contact the subscriber via the most appropriate communication device. For pagers, cellular phones and other sophisticated communication devices, including wireless telematic devices, in addition to providing a number of customizable messages to callers, additional actions can include the option of contacting the subscriber by alternate devices other than the selected single telephone connection. Additionally, a caller may indicate the priority of a call responsive to which the system can determine an action based on a predetermined set of rules.

FIG. 1 illustrates generally the communication system **8** of the present invention. The communication system **8** generally includes a communication device **12** used by caller **10**, communication networks **14, 18** and a communication node **16**. The communication system **8** further includes a number of optional communication devices **20, 24, 26** and **28** to be used by subscriber **38**.

To access and/or connect with the communication node **16**, caller **10** may utilize the communication device **12** of the communication system **8**. The communication devices **20, 24, 26** and **28** may be used by subscriber **38** to access and/or connect with communication node **16**. The communication devices **12** and **20, 24, 26** and **28** can include, but are not limited to, wire-line telephones, mobile telephones, paging units, radio units, wireless data devices, Web telephones, portable or wireless telephones, personal information managers (PIMs), personal digital assistants (PDAs), personal computers (PCs), network

televisions (TVs), Internet TVs, Internet telephones, portable wireless devices (i.e., two-way pagers), security systems (both mobile and premises-based), workstations, facsimile devices and printers or any other suitable communication devices.

5   The communication networks **14**, **18** of the communication system **8** can include, but are not limited to, wire-line, wireless, GSM, TDMA, AMPS based systems, intranets, extranets, the Internet, a Local Area Network (LAN), a telephone network, (e.g., a Public Switched Telephone Network (PSTN), private telephone networks, and so on), a cellular network, satellite networks, a personal

10   communication system, a TV network (e.g., a cable TV system), local, regional, national or global paging networks, an email system, a wireless data network (e.g., satellite data or local wireless data networks), a wireless LAN, a wireless local loop/distribution system (e.g., LMDS, MMDS or Code Division Multiple Access (CDMA) based system), a Voice Over Internet Protocol (VOIP) network,

15   or any other suitable network. The communication networks **14**, **18** can also include a wide area network (WAN), such as, for example, the Internet, the World Wide Web (WWW) or any other similar on-line service. It will be recognized that the communication networks **14**, **18** may have portions in common, may comprise two separate networks, or may be the same network.

20   Communication network **18** may connect to a number of communication devices used by subscriber **38** of the system; the devices are exemplified herein as communication device **20**, wireless communication device **24**, personal pager device **26** and alternate communication device **28**. It should be understood that other communication devices might be included in the system in addition to those

25   shown in the figure.

     The communication node **16** of the communication system **8** can include, but is not limited to, an interactive voice response node, a server computer, the MIX™ platform and the Myosphere™ Service provided by Motorola, Inc. of Schaumburg, IL (as further described with reference to **FIG. 5**), or other suitable

30   system. It will be recognized that the communication node **16** may be integrated within or may be remote from the communication networks **14**, **18**. Further, the communication node **16** may be integrated in a central system or may be a distributed system.

The communication devices **12, 20, 24, 26** and **28** communicate with communication networks **14, 18** via the communication node **16**. The communication network **14, 18** can interface with the communication devices **12, 20, 24, 26** and **28** through wire-line or wireless networks or systems (i.e., telephone or televisions systems, Integrated Services Digital Network (ISDN) systems, coaxial lines, computer networks, digital end user lines, private networks, wireless local loop systems, etc.).

The communication node **16** may incorporate, or be associated with or in communication with an electronic calendar or scheduler **30**, voice mail system **32**, rules engine **34**, databases **36** and a location and presence engine **40**. The scheduler **30** may be an electronic scheduler application; such as that available in Microsoft® Outlook, or the like, which is accessible to the subscriber **38** and in communication with the communication node **16**. Preferably, the subscriber **38** can assign priorities to each event scheduled in the scheduler **30**. The voice mail system **32** is any voice mail system that is capable of being accessed by the communication node **16** and capable of recording messages and playing back a number of messages in response to a request from the communication node **16**. The communication node **16** can access the rules engine **34**. The communication node **16** can use the rules engine **34** to make determinations based on subscriber information stored in databases **36** and other criteria, such as the location of the subscriber and the time of call. The determinations can include call forwarding and voicemail playback. Databases **36** may be a single database or a multiple database system, housed in a single server, or the like, or located in multiple servers and locations. Databases **36** are accessible by the subscriber **38** and may include subscriber information stored as preferences, rules, voice mail preferences and voice mail messages and so on, as will be described more fully hereinafter. The location and presence engine **40** is a system or interface adapted to obtain location and presence information of the subscriber. The engine **40** is adapted to detect presence which is defined as whether the subject is busy, available, not available, offline and online and so on.

As further described below, the communication system **8** can provide various services and capabilities to cellular end users, wire-line telephone end users, paging end users, satellite end users, mobile or portable telephone end

users, trunked end users, computer network end users (e.g., Internet or Intranet end users), wireless data end users, branch office end users and the like. In addition to recording voice messages and routing incoming communications, for example, by way of the voicemail system **32** and a routing and messaging system (not shown), the communication system **8** can provide speech and/or touch-tone recognition, incoming call authorization, call routing, text-to-speech (TTS) and/or speech-to-text (STT) capabilities, content information, messaging services, call screening, interactive voice applications, instant messaging and unified messaging services, and so on.

FIG. 2 illustrates one embodiment of an initial routine, generally referred to by reference character **100**, for populating the databases **36** and setting the rules in accordance with the present invention. Before the system **8** is fully operational it is preferable to populate databases **36** depending on the options offered by a service provider or subscribed to by the subscriber **38**. It will be understood that the order that the various databases are populated is not critical to the invention. Generally, the initial routine includes population of or provisioning of the various databases with information that the system uses to perform various determinations and select and execute various actions. The provisioning of the databases may be done directly by the subscriber, by an assistant or by members of the service provider or by synchronizing with other databases. Revisions or maintenance of the databases may occur in a similar fashion. In all probability, however, the subscriber would most efficiently perform maintenance of the scheduler database.

The databases included in the initial routine include a subscriber information database. With respect to block **110**, the subscriber information database includes information such as schedule, location, available time, address book information and information pertaining to determining the location of the user. The subscriber information may include a priority associated with each entry in the schedule. Entries may include meetings, for example. Also, a priority can be assigned to each location or address in the supplied address book information. In this manner, a priority, relative to a subscriber location, is assignable for use by the system in making a determination as to what action should be taken in response to an incoming call.

With respect to block **120**, the initial routine includes the entering of information related to each calling party, i.e., caller ID mapping. Caller ID mapping allows the system **8** to identify incoming callers according to caller ID. The caller ID may originate from caller line identification (CLI), caller device

5 identification or a manual input of caller identification. The caller identity may be derived from a phone number, an IP address, network identification, or an e-mail address or a PIN number or the like. Identification by CLI is known in the art. Manual input may include methods such as the caller entering a personal identification number (PIN), with or without a prompt by the system and audibly

10 projecting voice identification or the like. Other methods to identify the caller include voice authentication, identification of IP address and other device identification information.

With respect to block **130**, the initial routine includes the entering of customization information. In this step, the subscriber **38** can enter a number of

15 custom voice mail messages, personal voice messages, pager number and personal voice prompts and other information, such as contact information to be used by the voice mail system **32**. The subscriber also may provide information relating to his or her alternate communication devices such as a pager number. The subscriber **38** or the service provider, or the like, may also provide

20 information relating to finding the location or the subscriber presence information. For example, this may include configuring the information needed to access a location determination and presence engine. In the event that an initial call attempt is unsuccessful and the system determines that the subscriber should be contacted by alternate communication devices (as opposed to recording a

25 message) the information relating to the alternate communication devices enables the system **8** to perform a further attempt to contact the subscriber.

With respect to block **140** and block **150**, the initial routine includes the entering of subscriber rules (block **140**) and subscriber rule actions (block **150**). The subscriber rules are rules that instruct the system (in one embodiment,

30 performed by a rules engine) as to how to proceed according to various variables defined in the rules database. The rule actions are the actions which the system performs responsive to the determinations made by the rules engine. The variables to be included in the rules database include the caller identity, caller

priority, the subscriber location, time of call, subscriber status, and the action. An example of a rules table for a rules database is shown below in **Table 1**.

TABLE I					
Caller Identity	Call Priority of Caller	Subscriber Location	Time of Call	Subscriber Busy Status (Priority)	Action
<Default> or Unknown	<Any>	<Any>	<Any>	<Any>	Regular voicemail
123.33.34.555 (IP Address) or 123-456-7890 Telephone #)	<Any>	<Any>	8am-5pm M-F	<Any>	Regular Voicemail + Pager Information
Spouse@spouses company.com	Low (Normal)	Office	8am-5pm M-F	At desk (Low)	Regular Voicemail + Option to Page
Spouse@spouses company.com	Medium	Office	8am-5pm M-F	At Desk (Low)	Regular Voicemail + Automatic Page to Subscriber
123-456-7890 (Spouse's Office)	Low, Medium	<Any>	<Any>	Meeting (Medium)	Customized Voicemail + Option to Page
123-456-7890 (Spouse's Office)	High	Office	<Any>	<Any>	Customized Voicemail + Schedule Info + Automatic Page to Subscriber
123-456-7890 (Spouse's Office)	High	Not in Office	<Any>	<Any>	Customized Voicemail (e.g., "Not in Office") + Contact/Location Info + Automatic Page to Subscriber

Referring to **Table 1**, the rules database **36** may include a caller identity, a call priority (that may be a caller priority or a call device priority) a subscriber location, a time of call, a subscriber status (priority) and an action portion. As discussed above, the caller identity may be determined by CLI, caller device identification or an input code by keypad, voice or other known methods.

The call priority may be determined through the caller identity or may be input manually by the caller **10** before or after a prompt from the system **8**. The caller **10** may input the priority by keypad, voice or other methods. The subscriber location is determined by the system **8** accessing the electronic scheduler **30** with location information or a location and presence determination system, or the like, of the subscriber. The time of call is derived from the time the call is received by the system.

The subscriber status (priority) may be determined by the system **8** obtaining the status from the subscriber scheduler **30**, address book **36**, location and presence engine **40**, a combination thereof and the like. In the alternate, the status/priority may be changed or overridden by the subscriber **38** when, for example, the subscriber, contrary to the entry in the scheduler, unexpectedly becomes busy or unoccupied. In this manner the subscriber can provide feedback to the process, in that, the subscriber **38** may perform a change of

status in real time by either electing to receive a communication directed to the subscriber **38** by the system **8** or directing the system to direct the call to a voicemail **32** option or any one of several options. The options can include directing the system to execute a second action based on the feedback or a

5   number of sequential actions including call forwarding, first and second call actions, sending a message and so on.

The action fields may include a number of options. For example, a regular and a number of customized voicemails may be specified. The rules table in the database **36** may specify pager and wireless telephone information. The rules

10   may specify a number of other options including automatic page options, forwarding of the call to an administrative assistant, forwarding of the call to an alternate phone device, forwarding of the call to a wireless information device and/or the provision of contact/location information, and forwarding of the call to a personal assistant that may transcribe the message and can dispatch it in a

15   different format such as an instant message. The portion of the system adapted to determine the location of the subscriber is also adapted to verify the location of the subscriber by known methods.

It can be seen in the examples given in **Table 1** that a caller **10** with an unknown identity will be presented with a regular voicemail regardless of a priority

20   of the call, the time of call, the subscriber location and so on. If a caller **10** identity is established, but does not match any of the stored caller identities, the caller can be presented with a regular voicemail and pager information regardless of the given priority, the subscriber location, and the subscriber status if the time of the call is during working hours. If the call arrives outside of the 8am-5pm work

25   hours, for example, the system **8** can be configured to merely present a regular voicemail or other options.

As can be seen in further examples, generally, it may be advantageous to configure the system **8** to provide more action options as the priority of the call becomes relatively high compared to that of the subscriber **38**. For example, if a

30   spouse places a call having a low priority, and the subscriber **38** is at an office location with a low priority, the system **8** can present a regular voicemail message with an option to page. If the spouse's caller priority is a medium priority, the system **8** can present a regular voicemail and automatically pages the subscriber.

If the spouse's caller priority is high, the system **8** presents a customized voicemail, schedule information, and executes an automatic page to the subscriber **38**.

Table 1 illustrates a number of optional scenarios and outcomes dependent upon the particular variables in a call event. Other scenarios are possible dependent upon the complexity of the rules and the possible actions to be taken. Accordingly, it will be understood that the table presented is illustrative in nature and not restrictive.

FIGS. 3 and **4** are presented to illustrate the method of the present invention generally referred to as reference characters **300** and **400**, respectively. It should be understood that the order of many of the steps as presented herein could be changed without affecting the functioning of the system **8** or the outcome. As such, the method presented herein should be considered exemplary in nature.

In block **310**, the caller identity is determined. The caller identity may identify the person calling by determining the CLI or caller device identity or an alternate method such as voice identification, inputting of a PIN number or the like. In block **320**, the call context/priority is determined. Examples of a call priority may include low, medium, normal, high and emergency. The call priority can be determined by the system accessing the rules database where a priority may be associated with each preexisting caller identity. The caller using a keypad, by voice or other manual data input, may set the call priority manually. In one example, a subscriber's supervisor can be assigned a high priority in the system so that calls from the supervisor are always given a high priority. In an emergency, a spouse may enter a high priority to evoke an action from the system that locates and contacts the subscriber instead of merely playing a voicemail response and offering to record a voice message.

In block **330**, the time of call is determined. The time of call can be used by the system when accessing the location database to determine the location of the subscriber. The time of call can be used to check the subscriber schedule, rules pertaining to specific times, days, weekends, night and so on. The time can be used to provide time and time zone based services. In block **340**, the subscriber status (priority) is determined. The system uses the schedule,

presence and location information, each with an associated priority to determine the subscriber or subscriber status. The status may include schedule information such as the subscriber being in a meeting – which may have priorities from low to high. If the subscriber is in a customer meeting the priority may be medium or

5   high since typically one might not wish to be disturbed during a meeting with an important client or customer. The schedule might include location information detailing the location of an off-site meeting with associated contact information including an address and off-site phone numbers. The location can include the subscriber being at home or at work, for example.

10   In block **350**, the system determines an initial data set using any of the determined caller ID, call context, call time and subscriber status. The initial data thus determined is compared to the rules via a rules engine and an action or action set is selected. The system can include paging and various message options at this point. The system, as shown in block **360**, determines or obtains

15   the subscriber preferences to select the call action. The subscriber preferences may include which of a pager number to use, a message to play, contact information, location information and alternate contact numbers or methods. Also, the system can perform paging and various message options.

In block **370**, the action selected in block **360** is executed. The actions

20   include the playing of a regular or customized voicemail message, execution of an automatic page or data communication (by wire phone, wireless phone, e-mail and so on), paging, instant messages, small message system (SMS) options and a presentation of other options. The other options include an option to page and the presentation of contact and/or location information. At block **410**, the

25   subscriber is given further options by the system. The subscriber may elect to receive the message via pager or wireless phone, for example, may select to direct the call to voice mail or offer other options. Essentially, in this manner the subscriber may interactively direct the system to one or more option. This interactive aspect of the invention allows the subscriber to direct the system in

30   response to a changing situation.

At block **420**, the system determines if the selected action has been successfully implemented. If the selected action has been successfully been implemented and carried out, the process terminates. If the action is

unsuccessful, the system (at **B**) loops back to block **340**, updates the subscriber status and continues sequentially through the steps to completion. For example, based on subscriber feedback, the system determines that the expected action has not been executed successfully and may seek an alternate action (including

5 further refinement of rules based on subscriber feedback).

Referring now to **FIG. 5**, an exemplary block diagram of another embodiment of a communication system **200** having the capability to select and execute an action based on a rules database as set forth in the above description is illustrated. The communication system **200** generally includes one or more

10 communication devices **201, 202, 203, 204, 205** (five being shown), an electronic network **206**, and one or more information sources (e.g., content providers **208, 221** (two being shown) and data and voice markup language servers **209, 251, 253, 257**).

The user (a caller or a subscriber) can access the electronic network **206**

15 by dialing a single direct access telephone number (e.g., a foreign telephone number, a local telephone number, or a toll-free telephone number or PBX) from the communication device **202**. The user can also access the electronic network **206** from the communication device **204** via the Internet **220** or WWW, from the communication device **203** via a paging network **211**, or from the communication

20 device **205** via a LAN, a WAN, an e-mail connection or in any other similar manner.

As shown in **FIG. 5**, the electronic network **206** includes a telecommunication network **210** and a communication node **212**. The telecommunication network **210** is preferably connected to the communication

25 node **212** via a high-speed data link, such as, for example, a T1 telephone line, a LAN, a WAN or a VOIP network. The telecommunication network **210** preferably includes a PSTN **214** and a carrier network **216**. The telecommunication network **210** can also include, for example, international or local exchange networks, cable TV networks, inter-exchange carrier or long distance carrier networks, cellular

30 networks (e.g., mobile switching centers), PBXs, satellite systems, wireless data networks and other switching centers such as conventional or

trunked radio systems (not shown), and so on. The electronic network **206** can also include additional telecommunication networks, such as, for example, a wireless data network **207**.

The PSTN **214** can include various types of communication equipment, such as, for example, ATM networks, Fiber Distributed Data networks (FDDI), T1 lines, cable TV networks, VOIP networks and the like. The carrier network **216** generally includes a telephone switching system or CO **218**. It will be recognized that the carrier network **216** can be any suitable system that can route calls to the communication node **212**, and the CO **218** can be any suitable wire-line or wireless switching system.

The communication node **212** is preferably configured to receive and process incoming calls from the carrier network **216** and the Internet **220**. The communication node **212** can receive and process pages from the paging network **211** and can also receive and process messages (e.g., e-mails) from the LAN, WAN, wireless data or e-mail system **213**.

When a user dials into the electronic network **206** from the communication device **202**, the carrier network **216** routes the incoming call from the PSTN **214** to the communication node **212** over one or more telephone lines or trunks. The incoming calls may enter the carrier network **216** through one or more "**888**" or "**800**" Inward Wide Area Telecommunications Services trunk lines, local exchange or long distance trunk lines. It is also contemplated that the incoming calls can be received from a cable, cellular or VOIP network or any other suitable system.

The communication node **212** answers the incoming call from the carrier network **216** and may retrieve an appropriate announcement (e.g., a welcome greeting) from a database, server or browser. The communication node **212** then plays the announcement to the caller. In response to audio inputs from the user, the communication node **212** retrieves information from a destination or database of one or

more of the information sources, such as the content providers **208**, **221** or the markup language servers **209**, **251**, **253**, **257**. After the communication node **212** receives the information, it provides a response to the user based upon the retrieved information.

The communication node **212** can provide various dialog voice personalities (e.g., a female voice, a male voice, etc.), and can implement various grammars (e.g., vocabulary) to detect and respond to the audio inputs from the user. In addition, the communication node **212** can automatically select various

5   speech recognition models (e.g., English, Spanish or English accent models) based upon a user's profile, communication device and/or speech patterns. The communication node **212** can also allow the user to select a particular speech recognition model.

When a user accesses the electronic network **206** from a communication

10   device **201, 202, 203, 204, 205** registered with the system (e.g., home telephone, work telephone, cellular telephone, etc.), the communication node **212** can by-pass a user screening option and automatically identify the user (or the type of communication device) through the use of ANI or CLI. After the communication node **212** verifies the call, the communication node **212** provides a greeting (e.g.,

15   "Hi, this is your personal agent, Mya. Welcome Bob. How may I help you?"). The communication node **212** then enters into a dialogue with the user, and the user can select a variety of services offered by the communication node **212**.

When the user accesses the electronic network **206** from a communication device not registered with the system (e.g., a payphone, a telephone of a non-

20   user, etc.), the communication node **212** answers the call and can prompt the user to enter his or her name and/or a personal identification number (PIN) using voice commands or DTMF signals. The communication node **212** can also utilize speaker verification to identify the particular speech pattern of the user. If the communication node **212** authorizes the user to access the system, the

25   communication node **212** provides a personal greeting to the user (e.g., "Hi, this is your personal agent, Mya. Welcome Ann. How may I help you?"). The communication node **212** then enters into a dialogue with the user, and the user can select various services offered by the communication node **212**. If the name and/or PIN of the user cannot be recognized or verified by the communication

30   node **212**, the user will be routed to a customer service representative.

Once the user has accessed the communication system **200**, the user may implement a wide variety of services and features by using voice commands, such as, for example, voice dialing, voice paging, facsimiles, caller

announcements, voice mails, reminders, call forwarding, call recording, content information (e.g., newspapers, etc.), read e-mail, read calendars, read "to-do" lists, banking, e-commerce. The communication system **200** can place outbound calls and pages to business and personal parties or contacts (e.g., friends,

5 clients, business associates, family members, etc.) in response to DTMF signals or voice commands. The calls can be routed through a telephone or electronic network to the selected party and the pagers can be sent to a selected party via a paging system. The communication system **200** can also receive calls routed through a telephone or electronic network.

10 As shown in **FIG. 5**, the communication node **212** preferably includes a telephone switch **230**, a voice or audio recognition (VRU) client **232**, a VRU server **234**, a controller or call control unit **236**, an Operation and Maintenance Office or a billing server unit **238**, a LAN **240**, an application server unit **242**, a database server unit **244**, a gateway server or router firewall server unit **246**, a

15 VOIP unit **248**, a voice browser **250**, a voice markup language server **251**, a messaging server **255** and a data markup language server **253**. Although the communication node **212** is shown as being constructed with various types of independent and separate units or devices, the communication node **212** can be implemented by one or more integrated circuits, microprocessors,

20 microcontrollers or computers which may be programmed to execute the operations or functions equivalent to those performed by the devices or units shown. It will also be recognized that the communication node **212** can be carried out in the form of hardware components and circuit designs and/or software or computer programs.

25 The communication node **212** can be located in various geographic locations throughout the world or the United States (e.g., Chicago, IL). The communication node **212** can be operated by one or more carriers (e.g., Sprint, Qwest, MCI, etc.) or independent service providers (e.g., Motorola, Inc.).

The communication node **212** can be integrated with the carrier network

30 **216** or can be located remote from the carrier network **216**. It is also contemplated that the communication node **212** may be integrated into a communication device, such as, for example, a wire-line or wireless telephone, a

radio device, a PC, a PDA, a PIM, etc., and can be programmed to connect or link directly to an information source.

The communication node **212** can also be configured as a standalone system to allow users to dial directly into the communication node **212** via a direct

5   access telephone number. In addition, the communication node **212** may comprise a telephony switch (e.g., a PBX or Centrix unit), an enterprise network or a LAN. In this configuration, the communication system **200** can be implemented to automatically connect a user to the communication node **212** when the user accesses a communication device.

10   When the telephone switch **230** receives an incoming call from the carrier network **216**, the call control unit **236** sets up a connection in the telephone switch **230** to the VRU client **232**. The communication node **212** can then enter into a dialog with the user regarding various services and functions. The VRU client **232** preferably generates pre-recorded voice announcements and/or messages to

15   prompt the user to provide inputs to the communication node **212** using voice commands or DTMF signals. In response to the inputs from the user, the communication node **212** retrieves information from a destination of one of the information sources and provides outputs to the user and can also route incoming calls to any one of the various outgoing communication options.

20   The telephone switch **230** is preferably connected to the VRU client **232**, the VOIP unit **248** and the LAN **240**. The telephone switch **230** receives incoming calls from the carrier network **216**. The telephone switch **230** also receives incoming calls from the communication device **202** routed over the Internet **220** via the VOIP unit **248**. The telephone switch **230** also receives messages and

25   pages from communication devices **203**, **205**, respectively. The telephone switch **230** is preferably a digital cross-connect switch, Model LNX, available from Excel Switching Corporation, Hyannis, MA. It will be recognized that the telephone switch **230** can be any suitable switch.

The VRU client **232** is preferably connected to the VRU server **234** and the

30   LAN **240**. The VRU client **232** processes voice communications, DTMF signals, pages and messages (e.g., e-mails). Upon receiving voice communications, the VRU client **232** routes the speech communications to the VRU server **234**. When the VRU client **232** detects DTMF signals, it sends a command to the call control

unit **236**. It will be recognized that the VRU client **232** can be integrated with the VRU server **234**.

The VRU client **232** preferably comprises a PC, such as, for example, a Windows NT compatible PC, with hardware capable of connecting individual

5   telephone lines directly to the telephone switch **230** or carrier network **216**. The VRU client **232** preferably includes a microprocessor, random access memory, read-only memory, a T1 or ISDN interface board, and one or more voice communication processing boards (not shown). The voice communication processing boards are preferably Dialogic boards, Antares Model, available from

10   Dialogic Corporation, Parsippany, NJ. The voice communication boards may include a voice recognition engine having a vocabulary for detecting a speech pattern. The voice recognition engine is preferably a RecServer software package, available from Nuance Communications, Menlo Park, CA.

The VRU client **232** can also include an echo canceler (not shown) to

15   reduce or cancel TTS or playback echoes transmitted from the PSTN **214** due to hybrid impedance mismatches. The echo canceler is preferably included in an Antares Board Support Package, also available from Dialogic.

The call control unit **236** is preferably connected to the LAN **240**, and sets up the telephone switch **230** to connect incoming calls to the VRU client **232**. The

20   call control unit **236** also sets up incoming calls or pages to the communication node **212** over the Internet **220** and pages and messages sent from the communication devices **203**, **205** via the paging network **211** and e-mail system **213**, respectively. The control call unit **236** preferably comprises a PC, such as, for example, a Windows NT compatible PC.

25   The LAN **240** allows the various components and devices of the communication node **212** to communicate with each other via twisted pair, fiber optic, coaxial cables or the like. The LAN **240** may use Ethernet, Token Ring or other suitable types of protocols. The LAN **240** is preferably a 100 Megabit per second Ethernet switch, available from Cisco Systems, San Jose, CA, and can

30   comprise any suitable network system. The communication node **212** may include a plurality of LANs.

The VRU server **234** is connected to the VRU client **232** and the LAN **240**. The VRU server **234** receives voice communications from the user via the VRU

client **232**. The VRU server **234** processes the voice communications and compares the voice communications against a vocabulary or grammar stored in the database server unit **244** or a similar memory device. The VRU server **234** provides output signals, representing the result of the voice communications

5   processing, to the LAN **240**. The LAN **240** routes the output signal to the call control unit **236**, the application server unit **242** and/or the voice browser **250**. The communication node **212** then performs a specific function associated with the output signals.

         The VRU server **234** preferably includes a TTS unit **252**, an automatic

10   speech recognition (ASR) unit **254**, and a STT unit **256**. The TTS unit **252** receives textual data or information (e.g., e-mail, web pages, documents, files, etc.) from the application server unit **242**, the database server unit **244**, the call control unit **236**, the gateway server unit **246**, the application server unit **242** and the voice browser **250**. The TTS unit **252** processes the textual data and

15   converts the data to voice data or information.

         The TTS unit **252** can provide data to the VRU client **232**, which reads or plays the data to the user. For example, when the user requests information (e.g., news updates, stock information, traffic conditions, etc.), the communication node **212** retrieves the desired data (e.g., textual information) from a destination

20   of the one or more of the information sources and converts the data via the TTS unit **252** into a response.

         The response is then sent to the VRU client **232**. The VRU client **232** processes the response and reads an audio message to the user based upon the response. It is contemplated that the VRU server **234** can read the audio

25   message to the user using human recorded speech or synthesized speech. The TTS unit **252** is preferably a TTS 2000 software package, available from Lernout and Hauspie Speech Product NV, Burlington, MA.

         The ASR unit **254** provides speaker dependent or independent automatic voice recognition of voice communications from the user. It is contemplated that

30   the ASR unit **254** can include speaker dependent voice recognition. The ASR unit **254** processes the voice communications to determine whether a word or a speech pattern matches any of the grammars or vocabulary stored in the database server unit **244** or downloaded from the voice browser **250**. When the

ASR unit **254** identifies a selected speech pattern of the voice communications, the ASR unit **254** sends an output signal to implement the specific function associated with the recognized speech pattern. The ASR unit **254** is preferably a speaker independent voice recognition software package, RecServer Model, also available from Nuance Communications. It is contemplated that the ASR unit **254** can be any suitable voice recognition unit to detect voice communications.

The STT unit **256** receives voice communications and converts the voice communications to textual information (e.g., a text message). The textual information can be sent or routed to the communication devices **201, 202, 203, 204, 205**, the content providers **208, 221**, the markup language servers **209, 251, 253, 257**, the voice browser **250** and the application server unit **242**. The STT unit **256** is preferably a Naturally Speaking software package, available from Dragon Systems, Newton, MA.

The VOIP unit **248** is preferably connected to the telephone switch **230** and the LAN **240**. The VOIP unit **248** allows a user to access the communication node **212** via the Internet **220** or VOIP public network using voice commands. The VOIP unit **248** can receive VOIP protocols (e.g., H.323 protocols) transmitted over the Internet **220** or Intranet, and can convert the VOIP protocols to voice information or data. The voice information can then be read to the user via the VRU client **232**. The VOIP unit **248** can also receive voice communications from the user and convert the voice communications to a VOIP protocol that can be transmitted over the Internet **220**. The VOIP unit **248** is preferably a Voice Net software package, also available from Dialogic Corporation. It will be recognized that the VOIP unit **248** can be incorporated into a communication device.

The communication node **212** also includes a detection unit **260**. The detection unit **260** is preferably a phrase or key word spotter unit, detecting incoming audio inputs or communications or DTMF signals from the user. The detection unit **260** is preferably incorporated into the telephone switch **230**, but can be incorporated into the VRU client **232**, the carrier network **216** or the VRU server **234**. The detection unit **260** is preferably included in a RecServer software package, also available from Nuance Communications.

The detection unit **260** records the audio inputs from the user and compares the audio inputs to the vocabulary or grammar stored in the database

server unit **244**. The detection unit **260** continuously monitors the user's audio inputs for a key phase or word after the user is connected to the node **212**. When the detection unit **260** detects the key phrase or word, the VRU client **232** plays a pre-recorded message to the user. The VRU client **232** then responds to the

5   audio inputs provided by the user.

The billing server unit **238** is preferably connected to the LAN **240**. The billing server unit **238** can record data about the use of the communication node **212** by a user (e.g., length of calls, features accessed by the user, etc.). Upon completion of a call by a user, the call control unit **236** sends data to the billing

10   server unit **238**. The billing server unit **238** can subsequently process the data in order to prepare customer bills. The billing server unit **238** can use the ANI or CLI of the communication device to properly bill the user. The billing server unit **238** preferably comprises a Windows NT compatible PC.

The gateway server unit **246** is preferably connected to the LAN **240** and

15   the Internet **220**. The gateway server unit **246** provides access to the content provider **221** and the voice markup language server **257** via the Internet **220**. The gateway server unit **246** allows users to access the communication node **212** from the communication device **202** via the Internet **220**. The gateway server unit **246** can function as a firewall to control access to the communication node **212** to

20   authorized users. The gateway server unit **246** is preferably a Cisco Router, also available from Cisco Systems.

The database server unit **244** is preferably connected to the LAN **240**. The database server unit **244** preferably includes a plurality of storage areas to store data relating to users, such as, for example, speech vocabularies, dialogs,

25   personalities, user entered data, and other information as discussed above. Preferably, the database server unit **244** stores a personal file or address book. The personal address book can contain information required for the operation of the communication system **200**, including user reference numbers, personal access codes, personal account information, contact's addresses, telephone

30   numbers, etc. The database server unit **244** is preferably a PC, such as, for example, a Windows NT compatible PC.

The application server unit **242** is preferably connected to the LAN **240** and the content provider **208**. The application server unit **242** allows the

communication node **212** to access information from a destination of the information sources, such as the content providers **208**, **221** and the markup language servers **209**, **251**, **253**, **257**. For example, the application server unit **242** can retrieve information (e.g., weather reports, stock information, traffic

5   reports, restaurants, flower shops, banks, calendars, "to-do" lists, e-commerce, etc.) from a destination of the information sources. This application server unit **242** may include Starfish Software to provide the address book, calendar and to-do lists, and to allow the user to organize information. The application server unit **242** processes the retrieved information and provides the information to the VRU

10   server **234** and the voice browser **250**. The VRU server **234** can provide an audio announcement to the user based upon the information using TTS synthesizing or human recorded voice. The application server unit **242** can also send tasks or requests (e.g., transactional information) received from the user to the information sources (e.g., a request to place an order for a pizza). The application server unit

15   **242** can further receive user inputs from the VRU server **234** based upon a speech recognition output. The application server unit **242** is preferably a PC.

The voice markup language server **251** is preferably connected to the LAN **240**. The voice markup language server **251** can include a database, scripts and markup language documents or pages. The voice markup language server **251** is

20   preferably a PC, such as, for example, a Windows NT compatible PC. It will also be recognized that the voice markup language server **251** can be an Internet server (e.g., a Sun Microsystems server).

The messaging server **255** is preferably connected to the LAN **240**, the paging network **211**, an e-mail system **213** and a short message system (SMS)

25   **290**. The messaging server **255** routes pages between the LAN **240** and the paging network **211**. The messaging server **255** is preferably a PC, such as, for example, a Windows NT compatible PC. The messaging server **255** can also provide direct storage. It is contemplated that the messaging server **255** can reside externally from the communication node **212**.

30   The voice browser **250** is preferably connected to the LAN **240**. The voice browser **250** preferably receives information from the markup language servers **209**, **251**, **253**, **257**, the database server unit **244** and the content providers **208**, **221**. In response to voice commands or DTMF signals, the voice browser **250**

generates a content request (e.g., an electronic address) to navigate to a destination of one or more of the information sources. The content request can use at least a portion of a Uniform Resource Locator, an Internet Protocol, a page request, or e-mail.

5   After the voice browser **250** is connected to an information source, the voice browser **250** preferably uses a Transmission Control Protocol/Internet Protocol connection to pass requests to the information source. The information source responds to the requests, sending at least a portion of the requested information, represented in electronic form, to the voice browser **250**. The

10   information can be stored in a database, and can include text content, markup language document or pages, non-text content, dialogs, audio sample data, recognition grammars, etc. The voice browser **250** then parses and interprets the information, further described below. The voice browser **250** can be integrated into the communication devices **201, 202, 203, 204, 205**.

15   As shown in **FIG. 5**, the content provider **208** is connected to the application server unit **242** of the communication node **212**, and the content provider **221** is connected to the gateway server unit **246** of the communication node **212** via the

Internet **220**. The content providers **208, 221** can store various content

20   information, such as news, banking, commerce, weather, traffic conditions, etc. The content providers **208, 221** can include a server to operate WWW pages or documents in the form of a markup language. The content providers **208, 221** can also include a database, scripts and/or markup language documents or pages. The scripts can include images, audio, grammars, computer programs,

25   etc. The content providers **208, 221** execute suitable server software to send requested information to the voice browser **250**.

The voice mail unit **274** is preferably connected to the telephone switch **203** and the LAN **240**. The voice mail unit **274** can store voice mail messages from parties trying to send messages to the communication node **212**. When a

30   user accesses the electronic network **206**, the voice mail unit **274** can notify the user of new and stored messages. The user can access the messages to play, delete, store and forward the messages. When the user accesses a message, the message can be read to the user or can be displayed as textual information

on a communication device (e.g., a pager, a SMS **290**, or a PDA, etc.). The user can also access and operate external messages or mail systems remote from the electronic network **206**.

The FAX server unit **272** is preferably connected to the telephone switch

5   **230** and the LAN **240**. The FAX server unit **272** receivers and stores facsimile information sent via the electronic network **206** or the carrier network **216**. Users can access the facsimile information to play, store, delete, and forward the information. The facsimile information can be read via the TTS unit **252** or can be displayed as textual information on a suitable communication device. The FAX

10   server unit **272** preferably comprises a PC, such as, for example, a Windows NT compatible PC or a Dialogue Fax Server.

Further information regarding communication system **200** is disclosed in U.S. Patent Application No. 09/141,485, entitled Telecommunication System and Methods Therefor, filed August 27, 1998, the entire disclosure of which is

15   incorporated herein.

It should be appreciated that the embodiments described above are to be considered in all respects only illustrative and not restrictive. The scope of the invention is indicated by the following claims rather than by the foregoing description. All changes that come within the meaning and range of equivalents

20   are to be embraced within their scope.